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TIP BLIGHT OF PONDEROSA PINE SEEDLINGS AT THE FANTASY FARMS NURSERY, PECK, IDAHO

by

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At the request of John Kayler, nurseryman, an evaluation was conducted to identify fungi associated with tip blight and dieback of ponderosa pine seedlings at the Fantasy Farms Nursery near Peck, Idaho. The disease was most prevalent in 1-0 pine seedbeds (figure 1), where affected seedlings were scattered throughout beds rather than being concentrated in groups or restricted to certain areas. Tip blight was also located on a few scattered 2-0 seedlings.

Affected seedlings had necrotic tips with some stem dieback (figure 2). Purple lesions were common on the main stem and affected tips usually remained upright and straight or only slightly bent. Black fruiting bodies were prominent on necrotic needles and stems. These were mostly concentrated on the upper sides and at the bases of needles. Purple discoloration was prominent on the proximal ends of needles near the stem.

Figure 1.--1-0 ponderosa pine bareroot seedlings with tip blight and dieback at the Fantasy Farms Nursery. Affected seedlings were scattered throughout beds.

Figure 2.--Ponderosa pine seedling with tip blight from the Fantasy Farms Nursery. Small black fruiting bodies were prominent on the upper surface of needles near attachment to the main stem.

METHODS

Tip blighted seedlings were taken to the laboratory for isolation of associated organisms. The small black fruiting bodies (pycnidia) and their spores (conidia) from necrotic needles were examined under the compound microscope (100-1000x). Diplodia pinea (Desm.) Kickx. was identified as the major source of sporulation on necrotic tissues.

Samples of necrotic needle and stem tissue were surface sterilized in 10 percent sodium hypochlorite solution for 1 min. and incubated on 2 percent water agar (WA) at 25° C for several days. Emerging fungi were transferred to potato dextrose agar (PDA) slants and identified.

RESULTS AND DISCUSSION

Diplodia pinea sporulated profusely on and was frequently isolated from necrotic tissues. The fungus was identified on the basis of pycnidial production and conidial morphology.

Diplodia pinea is a pathogen of pines that usually causes branch tip dieback. In the Great Plains of the U.S. the pathogen causes most damage to trees older than 30 years (Peterson 1981a), whereas in New Zealand severe infection is confined to trees less than 7-8 years old. The fungus has also been implicated as causing root disease of planted pine in South Africa (Wingfield and Knox-Davies 1980).

Diplodia has often been reproted as a pathogen of nursery pine seedlings (Bancroft 1911; Crandall 1938; Croghan 1981; Peterson 1981a; Rowan 1968). The fungus has mostly been associated with tip blight and dieback (James 1979; Rowan 1968), although it may also cause collar rot (Punthalingham and Waterson 1970). Most damage to seedlings has occurred within beds adjacent to or near mature pine trees, the probable source of inoculum (Peterson 1981a; Peterson 1981b).

Diplodia pinea infects new pine shoots shortly after elongation (Chou 1977; Peterson 1977; Peterson 1981b). Most infection occurs before emergence of needles from their sheaths (Waterman 1943). Succulent needles can also become infected (Brookhouser and Peterson 1971; Waterman 1943), as well as seed cones in their second year (Peterson 1981a; Peterson 1981b). Spores are dispersed from March to October, but infection can only occur during periods of prolonged moisture availability on the surface of susceptible host tissues (Brookhouser and Peterson 1971; Peterson 1981a). Diplodia readily infects wounded tissues (Marks and Minko 1969; Peterson 1981a), but it can also penetrate unwounded elongating tissues (Chou 1978; Waterman 1943). After penetration, the fungus often colonizes pith tissues where it can either advance rapidly causing necrosis or remain inactive (Foster and Marks 1968; Marks and Minko 1969). There is evidence that D. pinea produces toxins which kill host tissues in advance of hyphal colonization (Foster and Marks 1968).

Diplodia may sporulate abundantly on the scales of infected cones, providing inoculum for spread within the same tree, to surrounding trees, or to nearby seedling nurseries (Peterson 1977; Peterson 1981b). Once the fungus becomes established in nurseries, its rain-splashed spores can spread to and cause infection of surrounding seedlings.

Control of Diplodia tip blight in nurseries is best achieved by a combination of cultural and chemical methods which reduce available inoculum and protect seedlings from infection. Susceptible ponderosa on exotic pine seedlings should be monitored throughout the growing season for symptoms such as necrosis or lesions on needles or elongating stems. Infected seedlings should be removed as soon as they are discovered (James 1979). It is espeically important to remove infected seedlings with D. pinea pycnidia to reduce chance of disease spread to nearby seedlings. All rogued seedlings should be removed from the nursery and not used as mulch.

Nearby stands of mature ponderosa pine probably provided inoculum for seedling infection at the Fantasy Farms Nursery. This can be confirmed by examining cones from these mature trees for Diplodia pycnidia (Peterson 1981a). To reduce future losses, susceptible pine seedlings should be grown in beds as far away from mature trees as possible (Peterson 1981a). Another alternative is to remove mature pine trees around susceptible seedbeds. This will reduce chances for seedling infection.

Infection of new shoots on 2-0 seedlings can be reduced by applying fungicides to pines during and shortly after budbreak in the spring (Peterson 1977; Peterson 1981a). Benomyl[1], chlorothalonil[2], and Bordeaux mixture[3] are usually effective (Peterson 1981a; Schweitzer and Sinclair 1976). For 1-0 seedlings, fungicides might have to be applied at biweekly intervals throughout much of the growing season if damage is severe and wet conditions prevail (James 1979).

Another fungus besides D. pinea was commonly isolated from tip blighted pine seedlings. This was Phoma eupyrena Sacc.,a common soil inhabitant (Dorenbosch 1970) which has previously been associated with conifer seedling diseases (James 1980; James 1983a). This fungus was recently associated with chlorosis and mortality of Mugo pine (Pinus mugo Turra) at the Fantasy Farms Nursery (James 1983b).

Pathogenicity tests are necessary to elucidate actual role of this fungus in causing tip blight of ponderosa pine seedlings. Chemical control procedures outlined for D. pinea should be applicable to P. eupyrena as well.

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[1] Benomyl = Methyl-1-(butylcarbamoyl)-benzimidazole carbamate.
[2] Chlorothalonil = Tetrachlorosiophthalonitrile.
[3] Boreaux mixture = Mixture of copper sulfate and calcium hydroxide (lime) forming basic copper sulfate.

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